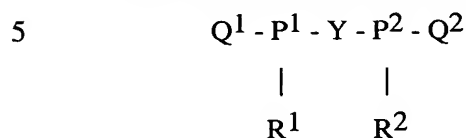


## CLAIMS

1. A peptide-based gemini compound comprising two linked chains:

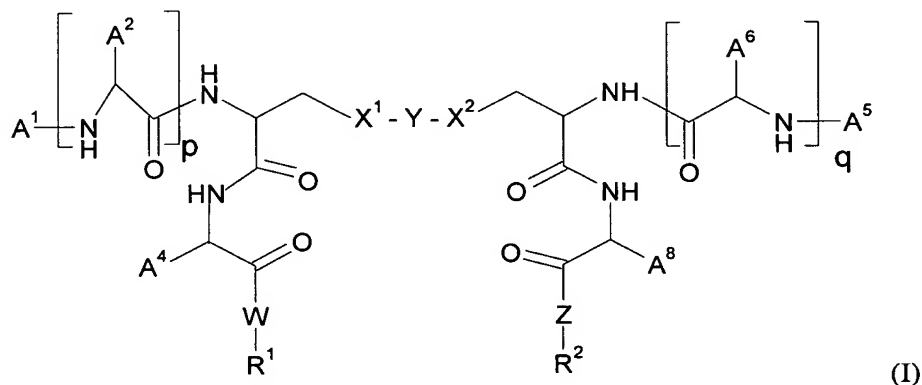


each chain having:

- (1) a positively charged hydrophilic head,  $Q^1$  or  $Q^2$ , formed from one or more amino  
10 acids and/or amines  
(2) a central portion,  $P^1$  or  $P^2$ , having a polypeptide backbone, and  
(3) a hydrophobic tail,  $R^1$  or  $R^2$ ,  
the central sections of each chain being linked together by bridge Y through residues in  
 $P^1$  and  $P^2$ .

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2. A peptide-based gemini compound according to claim 1 which has the formula (I):



where:

- 20  $A^1$  and  $A^5$ , which may be the same or different, is a positively charged group formed from one or more amino acids or amines joined together in a linear or branched manner;  $A^2/A^6CH(NH)CO$ , which may be the same or different, is derived from an amino acid;  
 $p$  and  $q$ , which may be the same or different, is 0 or 1;  
25  $X^1/X^2CH_2CH(NH)CO$ , which may be the same or different, is derived from cysteine ( $X^1/X^2 = S$ ), serine or threonine ( $X^1/X^2 = O$ );

$A^4/A^8CH(NH)CO$ , which may be the same or different, is derived from serine or threonine;

Y is a linker group or a disulphide bond when  $X^1$  and  $X^2$  is each S;

$R^1$  and  $R^2$  are  $C_{(10-20)}$  saturated or unsaturated alkyl groups, and

- 5 W and Z are NH, O,  $CH_2$  or S; or  
a salt thereof.

3. A peptide-based gemini compound according to claim 2 wherein the  $A^1$  and  $A^5$   
10 groups are bonded by an amide (CONH) bond.

4. A compound according to claims 2 or 3 wherein  $A^1/A^5$  are D- or L-amino acids selected from arginine, lysine, ornithine and histidine.

5. A compound according to claims 2 to 4 wherein  $A^1/A^5$  have up to 7 amino acids  
15 linked in a linear or branched chain.

6. A compound according to claim 5 wherein  $A^1/A^5$  have two or three lysines or ornithines or a combination of lysine, ornithine, arginine and histidine.

- 20 7. A compound according to any one of claims 2 to 6 wherein the amino acid from which the  $A^2/A^6CH(NH)CO$  is derived is serine.

8. A compound according to any one of claims 2 to 7 wherein Y is  $(CH_2)_m$ , where m is  
25 an integer from 1 to 6.

9. A compound according to any one of claims 2 to 7 wherein Y is a disulphide bond when  $X^1$  and  $X^2$  is each S.

10. A compound according to claim 8 or 9 wherein m is 2.  
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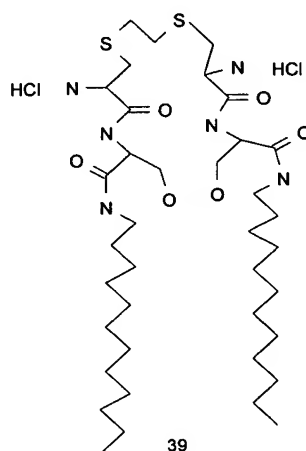
11. A compound according to any one of claims 2 to 10 wherein R is  $C_{12}$  alkyl.

12. A compound according to any one of claims 2 to 11 wherein W and Z are NH.

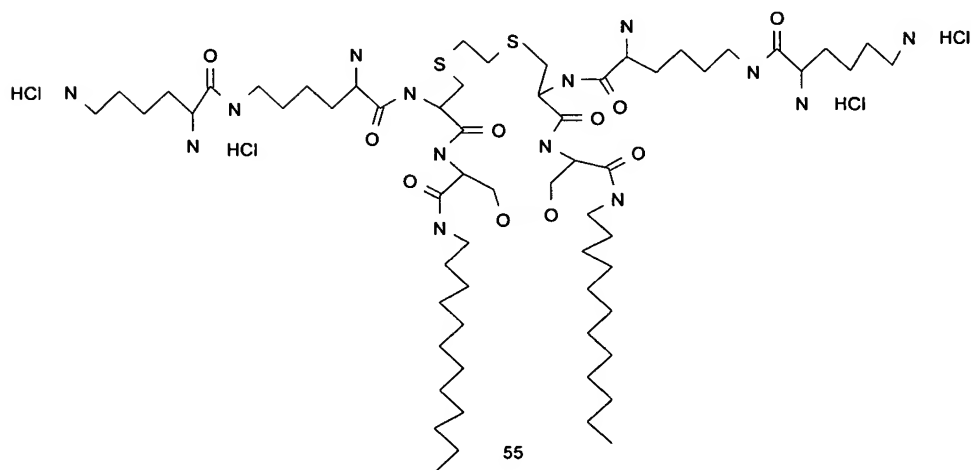
13. A compound according to any one of claims 2 to 12 wherein the salt is a pharmaceutically acceptable salt.

14. A compound according to any one of claims 1 to 13 which is symmetrical, that is  $A^1$  and  $A^5$  are the same,  $A^2$  and  $A^6$  are the same,  $A^4$  and  $A^8$  are the same,  $R^1$  and  $R^2$  are the same, and W and Z are the same.

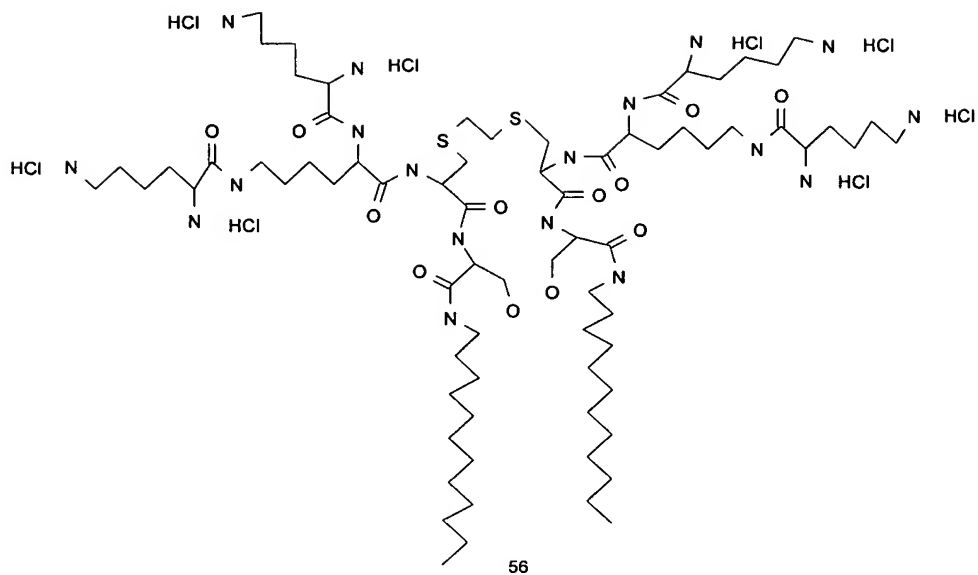
15. Compound 39: 2-amino-3-{2-[2-amino-2-(1-dodecylcarbamoyl-2-hydroxy-ethylcarbamoyl)-ethylsulphonyl]-ethylsulphonyl}-N-(1-dodecylcarbamoyl-2-hydroxy-ethyl)-propionamide, and derivatives thereof, compounds 40 to 58.



16. The compound:

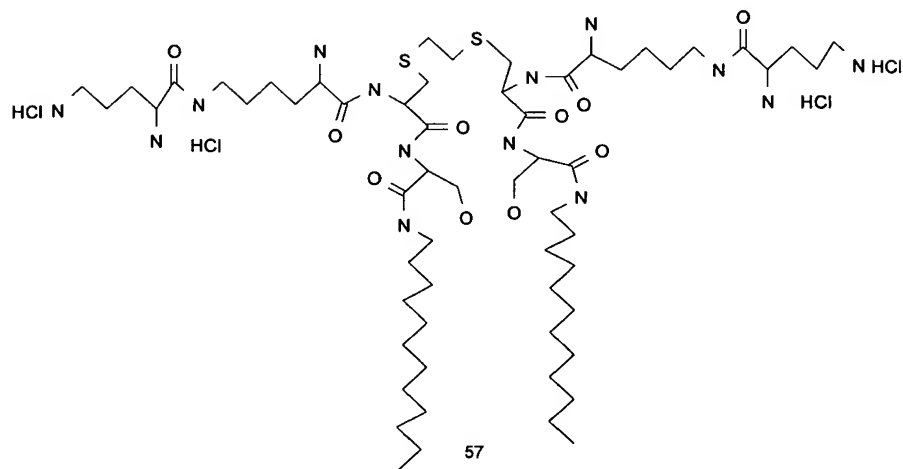


17. The compound:



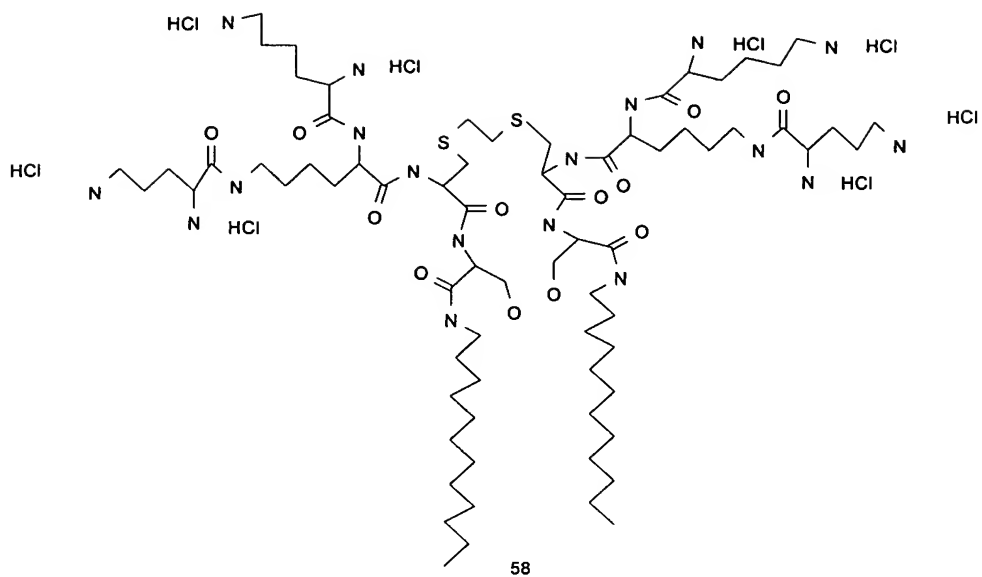
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18. The compound:

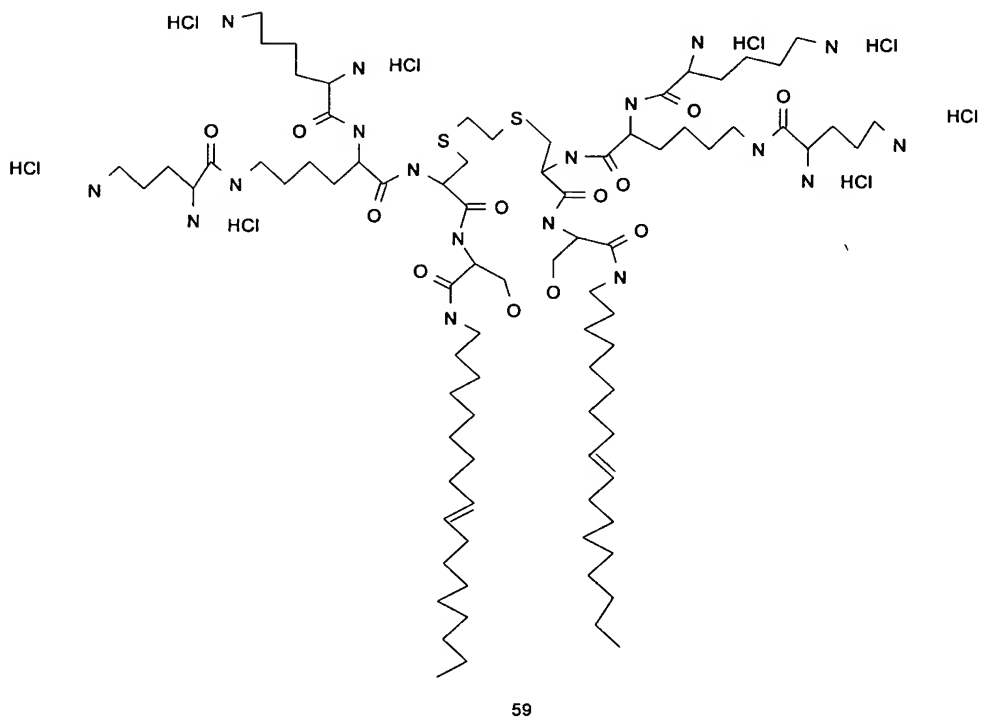


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19. The compound:



20. The compound:



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21. The use of a gemini-based peptide compound as defined in any one of claims 1 to 20 in enabling transfection of DNA or RNA or analogs thereof into a eukaryotic or prokaryotic cell *in vivo* or *in vitro*.

22. The use of a peptide-based gemini compound according to claim 21 wherein the compound is used in combination with one or more supplements selected from the group consisting of:
- 5 (i) a neutral carrier; or  
(ii) a complexing reagent.
23. The use according to claim 22 wherein the neutral carrier is dioleoyl phosphatidylethanolamine (DOPE).
- 10 24. The use according to claim 22 wherein the complexing reagent is PLUS reagent.
25. The use according to claim 22 wherein the complexing reagent is a peptide comprising mainly basic amino acids.
- 15 26. The use according to claim 25 wherein the peptide consists of basic amino acids.
27. The use according to claim 25 or 26 wherein the basic amino acids are selected from lysine and arginine.
- 20 28. The use according to claim 26 wherein the peptide is polylysine or polyornithine.
29. A method of transfecting polynucleotides into cells *in vivo* for gene therapy, which method comprises administering peptide-based gemini compounds of any one of claims 1 to 20 together with, or separately from, the gene therapy vector.
- 25 30. The use of a peptide-based gemini compound of any one of claims 1 to 20 to facilitate the transfer of a polynucleotide or an anti-infective compounds into prokaryotic or eukaryotic organism for use in anti-infective therapy.
- 30 31. The use of a peptide-based gemini compound of any one of claims 1 to 20 to facilitate the adhesion of cells in culture to each other or to a solid or semi-solid surface.

32. A process for preparing peptide-based gemini compounds of claim 1 or 2 which process comprises adding amino acids or peptides to 2-amino-3-{2-[2-amino-2-(1-dodecylcarbamoyl-2-hydroxy-ethylcarbamoyl)-ethylsulphanyl]-ethylsulphonyl}-N-(1-dodecylcarbamoyl-2-hydroxy-ethyl-)-propionamide.